

**What is claimed is:**

1. A high-speed signal processor which functions as a waveform acquisition system and a high-speed analog-to-digital converter, said processor comprising:
  - a filter system for dividing an input signal into a series of adjacent frequency
  - 5 bands;
  - a digitizer for digitizing each frequency band output from said filter system;
  - and
  - a system for reconstructing the original input signal.
2. The high-speed signal processor as recited in Claim 1, and further comprising a frequency down converter for down converting one or more of the adjacent frequency bands as they are output from said filter system.
3. The high-speed signal processor as recited in Claim 1, wherein said filter system comprises an M-band filter bank.
4. The high-speed signal processor as recited in Claim 3,, wherein the M-band filters in said M-band filter bank enable perfect reconstruction, meaning that the sum of the cascaded responses of the M-band analysis filters followed by the synthesis filters produces an overall flat amplitude response and group delay.
5. The high-speed signal processor as recited in Claim 3, wherein the M-band filters in said M-band filter bank are implemented optically using fiber optics.
6. The high-speed signal processor as recited in Claim 3, wherein the M-band filters in said M-band filter bank are implemented electronically.

7. The high-speed signal processor as recited in Claim 3, wherein the M-band filters in said M-band filter bank are implemented using software.

8. The high-speed signal processor as recited in Claim 3, wherein each channel output is equalized, to thereby shape the transfer function of the channel into that of an M-band filter.

9. The high-speed signal processor as recited in Claim 8, wherein the channel equalization is implemented with Weiner filter technology.

10. The high-speed signal processor as recited in Claim 1, wherein a calibration signal is continuously injected into said processor to serve as a reference for quantifying and removing hardware errors.

11. A method for processing signals, comprising :  
dividing an input signal into a series of adjacent frequency bands;  
digitizing each frequency band; and  
reconstructing the original input signal.